

What is claimed is:

1 1. A method of interlocking FFT window position recovery with sampling
2 clock control in symbol units in an orthogonal frequency division multiplexing
3 (OFDM) receiver for receiving an OFDM symbol consisting of a useful data interval
4 and a guard interval, the method comprising the steps of:

5 (a) extracting a pilot signal from fast-Fourier-transformed OFDM received
6 signals, and detecting inter-pilot phase differences;

7 (b) averaging phase differences detected in step (a) for a symbol and
8 normalizing the mean phase difference by dividing it into reference values
9 corresponding to phase differences generated when FFT window errors of at least
10 one sample exist; and

11 (c) simultaneously controlling the FFT window position offset using a value
12 obtained by rounding off the normalized value of the step (b), and the sampling
13 clock offset using the difference between the round-off value and the normalized
14 value.

1 2. The method of interlocking FFT window position recovery with
2 sampling clock control in an OFDM receiver as claimed in claim 1, wherein the FFT
3 window position offsets are controlled by integer values, and the sampling clock
4 offsets are controlled by fraction values.

1 3. An OFDM receiver for interlocking FFT window position recovery with
2 sampling clock control by receiving an OFDM symbol consisting of a useful data
3 interval and a guard interval, the apparatus comprising:

4 an analog-to-digital converter (ADC) for converting an OFDM signal into
5 digital complex samples;

6 an FFT window for removing the guard interval from the digital complex
7 samples output by the ADC and outputting useful data samples;

8 an FFT for fast-Fourier-transforming the samples output by the FFT window;

9 a phase difference calculator for calculating phase differences between two
10 values among the complex values received via a plurality of pilots from the FFT,

11 averaging these phase differences for one symbol, and normalizing the mean value
12 by dividing it into predetermined reference values;

13 an FFT window controller for rounding off the normalized value output by the
14 phase difference calculator and controlling the window position of the FFT window;
15 and

16 a phase synchronous loop for controlling the sampling clock signals of the
17 ADC using the difference between the round-off value and the normalized value.

1 4. The OFDM receiver for interlocking FFT window position recovery with
2 sampling clock control as claimed in claim 3, wherein the phase difference
3 calculator comprises:

4 a phase difference detector for detecting the phase differences between two
5 pilots among the received complex values of pilots output by the FFT;

6 a mean calculator for averaging the phase differences detected by the phase
7 detector for a symbol; and

8 a normalizer for normalizing the mean value obtained by the mean calculator
9 by dividing it into reference values corresponding to phase differences generated
10 when an FFT window error of one sample exists.

1 5. The OFDM receiver for interlocking FFT window position recovery with
2 sampling clock control as claimed in claim 4, wherein the phase difference of the
3 phase difference detector is set to be $\frac{\Delta\phi_{l,k_{n+1},n}}{k_{n+1}-k_n}$, $k_{n+1}-k_n$ is a frequency spacing
4 between two pilot carriers, and $\Delta\phi_{l,k_{n+1},n}$ is an inter-pilot phase difference for an i-th
5 symbol.

1 6. The OFDM receiver for interlocking FFT window position recovery with
2 sampling clock control as claimed in claim 4, wherein the mean value of the mean
3 calculator is set to be $\frac{1}{L} \sum_{n=1}^L \frac{\Delta\phi_{l,k_{n+1},n}}{k_{n+1}-k_n}$, and L represents the number of used pilots.

1 7. The OFDM receiver for interlocking FFT window position recovery with
2 sampling clock control as claimed in claim 4, wherein the normalization of the
3 normalizer is carried out by multiplying $\frac{N}{2\pi}$ to the mean value.